MXG Signal Generator

N5185A MXG Analog and N5186A MXG Vector Signal Generators

This manual provides documentation for the N5185A and N5186A running on the Linux operating system.

Notices

Trademark Acknowledgments

Bluetooth and the Bluetooth logos are trademarks owned by Bluetooth SIG, Inc., U.S.A. and licensed to Keysight Technologies, Inc.

Manual Part Number

N5186-90002

Edition

Warranty

Technology Licenses

U.S. Government Rights

Safety Notices

CAUTION

A **CAUTION** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a CAUTION notice until the indicated conditions are fully understood and met.

WARNING

A **WARNING** notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

Where to Find the Latest Information

Documentation is updated periodically. For the latest information about this product, including instrument software upgrades, application information, and product information, browse to the following URL:

https://www.keysight.com/us/en/product/N5185A/N5185A.htm

https://www.keysight.com/us/en/product/N5186A/N5186A.html

Information on preventing instrument damage can be found at:

http://keysight.com/find/PreventingInstrumentRepair

Is your product software up-to-date?

Periodically, Keysight releases software updates to fix known defects and incorporate product enhancements. To search for software updates for your product, go to the Keysight Technical Support website at:

http://www.keysight.com/find/techsupport

Product and Solution Cybersecurity

Keysight complies with multinational regulations for the cybersecurity of its own products and is committed to providing information to assist you in protecting your products and solutions from external cyber threats. For more information, see:

https://www.keysight.com/us/en/about/quality-and-security/security/product-and-solution-cyber-security.html

Keysight also recommends that you secure your IT environments using appropriate third-party tools. For instruments that run the Microsoft Windows operating system, Keysight concurs with Microsoft's recommendations for ensuring that the instrument is protected:

- Get the latest critical Windows updates

- For network-connected instruments, use an Internet firewall (in Keysight instruments, Windows Firewall is enabled by default)

- For network-connected instruments, use up-to-date antivirus and anti-spyware software

Responsible Disclosure Program

Keysight recommends that security researchers share the details of any suspected vulnerabilities across any asset owned, controlled, or operated by Keysight (or that would reasonably impact the security of Keysight and our users) using this form:

https://www.keysight.com/us/en/contact/responsible-disclosure-program.html

Report a Product Cybersecurity Issue

If you discover a cybersecurity issue that you suspect may involve Keysight's proprietary software, or third-party software supplied by Keysight as part of a product, or that may affect the operation of Keysight products, we encourage you to report it to us using this form:

https://www.keysight.com/us/en/about/quality-and-security/security/product-and-solution-cyber-security/report-a-product-cybersecurity-issue

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Getting Started Guide

1 Safety and Maintenance Information

The following topics can be found in this section:

KEYSIGHT
TECHNOLOGIES

Warnings, Cautions, and Notes

The documentation for this product uses the following safety notations. Familiarize yourself with each notation and its meaning before operating the signal generator.

WARNING	A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.
CAUTION	A CAUTION notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a caution until you fully understand the indicated conditions.Do not proceed beyond a CAUTION notice until the indicated conditions are fully understood and met.
NOTE	A NOTE calls the user's attention to an important point or special information in the text.
⚠	This marking on the product (for example, at the RF power and AC power ports) indicates that the user should refer to instructions in the documentation before using those features.

General Safety Considerations

WARNING	The safety of any system incorporating the equipment is the responsibility of the assembler of the system.
WARNING	If this product is not used as specified, the protection provided by the equipment could be impaired. This product must be used in a normal condition (in which all means for protection are intact) only.
NOTE	This product has been designed and tested in accordance with accepted industry standards, and has been supplied in a safe condition. The documentation contains information and warnings that must be followed by the user to ensure safe operation and to maintain the product in a safe condition.
NOTE	Proper Ergonomics should be considered when using accessories such as a keyboard or a mouse.
WARNING	More than one person may be required to safely lift or carry this instrument. Alternately, a mechanical lift can be used to eliminate the risk of personal injury.
WARNING	Cleaning connectors with alcohol shall only be done with the instruments power cord removed, and in a well-ventilated area. Allow all residual alcohol moisture to evaporate and the fumes to dissipate prior to energizing the instrument.
CAUTION	The instrument has an auto–ranging line voltage input – be sure the supply voltage is within the specified range and the voltage fluctuations do not exceed 10 percent of the nominal supply voltage.
CAUTION	The Mains wiring and connectors shall be compatible with the connector used in the premise electrical system. Failure to ensure adequate earth grounding by not using the correct components may cause product damage, and serious injury.
NOTE	The main power cord can be used as the system disconnecting device. It disconnects the mains circuits from the mains supply.

Protecting against electrostatic discharge

Electrostatic discharge (ESD) can damage or destroy electronic components (the possibility of unseen damage caused by ESD is present whenever components are transported, stored, or used).

Test Equipment and ESD

To help reduce ESD damage that can occur while using test equipment:

— Before connecting any coaxial cable to an instrument connector for the first time each day, momentarily short the center and outer conductors of the cable together.

— Personnel should be grounded with a 1 MΩ resistor-isolated wrist-strap before touching the center pin of any connector and before removing any assembly from the instrument.

— Be sure that all instruments are properly earth-grounded to prevent build-up of static charge.

— Perform work on all components or assemblies at a static-safe workstation.

— Keep static-generating materials at least one meter away from all components.

— Store or transport components in static-shielding containers.

— Always handle printed circuit board assemblies by the edges. This reduces the possibility of ESD damage to components and prevent contamination of exposed plating.

Additional Information About ESD

For more information about ESD and how to prevent ESD damage, contact the Electrostatic Discharge Association (http://www.esda.org). The ESD standards developed by this agency are sanctioned by the American National Standards Institute (ANSI).

Regulatory Compliance

Complies with the essential requirements of the European Low Voltage Directive as well as current editions of the following standards (dates and editions are cited in the Declaration of Conformity):

IEC/EN 61010-1

Canada: CSA C22.2 No. 61010-1

USA: UL std no. 61010-1

If there is a KC marking on the product (see Instrument Markings) then the following statement applies.

South Korean Class A EMC Declaration

This equipment has been conformity assessed for use in business environments. In a residential environment this equipment may cause radio interference.

사 용 자 안 내 문

이 기기는 업무용 환경에서 사용할 목적으로 적합성평가를 받은 기기로서 가정용 환경에서 사용하는 경우 전파간섭의 우려가 있습니다.
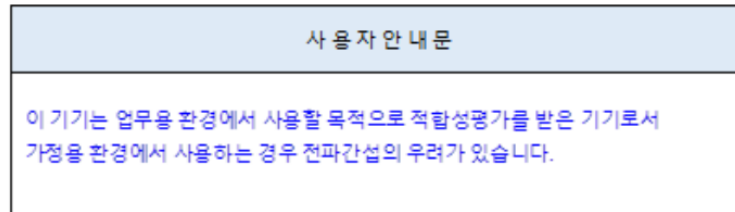
※ 사용자 안내문은 "업무용 방송통신기자재"에만 적용한다.

Unpack and Inspect the Instrument

Before unpacking your instrument, inspect the packaging container for evidence of mishandling during transit. Report any damage to the shipping agent immediately, as such damage is not covered by the warranty (refer to the warranty information at the beginning of this document).

Remove the instrument from the packaging container and ensure that all accessories are included. Inspect the instrument and accessories for damage. If the contents appear damaged, notify your local Keysight Technologies Inc. representative.

CAUTION	The instrument is shipped in a container which prevents damage from static. The instrument should only be removed from the packaging in an anti-static area ensuring that correct anti-static precautions are taken. Store the instrument in an anti-static envelope when not in use. (See "Protecting against electrostatic discharge" on page 12 page 19.)

NOTE	Visit www.keysight.com/find/tips for information on preventing damage to your Keysight equipment.

Verify N5185A/N5186A Shipment Contents

Qty	Keysight Part Number	Description
1	N5185A / N5186A	N5185A MXG Analog Signal Generator / N5186A MXG Vector Signal Generator
1	N5186-90001	Quick Start Poster
1	5061-7383	South Korean Class A EMC Declaration
1	5991-3402	End User License Agreement
1	9320-6691	China RoHS Addendum for Signal Generator
1	9320-6797	Keysight Safety Leaflet

CAUTION	Only Keysight approved accessories shall be used.

Weight and Dimensions

Instrument Weight

21.7 kg (max)

Instrument Dimensions

H x W x L: 103 mm x 475 mm x 590 mm

Shipping Problems?

If the shipping materials are damaged or the contents of the container are incomplete:

— Contact the nearest Keysight Technologies office.
— Keep the shipping materials for the carrier's inspection.
— If you must return the N5185A/N5186A MXG to Keysight Technologies, use the original (or comparable) shipping materials. See "Returning an Instrument for Service" on page 22.

Before Applying Power

⚠ Verify that all safety precautions are taken.

Refer to Chapter 1, "Safety and Maintenance Information", on page 9 for Caution and Warning information. Make all connections to the unit before applying power. Note the external markings described in the "Instrument Markings" on page 25.

WARNING	Use only the power cord supplied with the chassis. Keysight power cords ensure continuity between the chassis grounding-type power plug and the safety ground terminal at the power outlet.

WARNING	Install the chassis so that the detachable power cord is readily identifiable and is easily reached by the operator. The detachable power cord is the chassis disconnecting device. It disconnects the mains circuits from the mains supply to the chassis before other parts of the chassis. The front panel switch is only a standby switch and is not a LINE switch. Alternatively, an externally installed switch or circuit breaker (which is readily identifiable and is easily reached by the operator) may be used as a disconnecting device.

WARNING	This is a Safety Protection Class I Product (provided with a protective earthing ground incorporated in the power cord). The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. Any interruption of the protective conductor inside or outside of the product is likely to make the product dangerous. Intentional interruption is prohibited.

WARNING	Mains wiring and connectors shall be compatible with the connector used in the premise electrical system. Failure to ensure adequate earth grounding by not using correct components may cause product damage and serious injury.

CAUTION	This product is designed for use in Installation Category II and Pollution Degree 2.

Power Requirements

100/120 VAC, 50/60/400 Hz, 650 W Max
220/240 VAC, 50/60 Hz, 650 W Max

NOTE	The instrument can operate with mains supply voltage fluctuations up to ± 10% of the nominal.

Environmental Conditions (Operating)

For indoor use only.

Environmental Condition	Requirement
Temperature Range for **1-channel** instruments	0 to 55° C
Maximum Relative Humidity (non-condensing) for **1-channel** instruments	95% RH up to 40° C, decreasing to 45% RH at 55° C. From 40° C to 55° C, the maximum % Relative Humidity follows the line of constant dew point.
Temperature Range for **2-channel/4-channel** instruments	0 to 50° C
Maximum Relative Humidity (non-condensing) for **2-channel/4-channel** instruments	95% RH up to 40° C, decreasing to 57% RH at 50° C. From 40° C to 50° C, the maximum % Relative Humidity follows the line of constant dew point.
Altitude (m)	4600 m

Samples of this product have been type tested in accordance with the Keysight Environmental Test Manual and verified to be robust against the environmental stresses of Storage, Transportation and End-use; those stresses include but are not limited to temperature, humidity, shock, vibration, altitude and power line conditions. Test Methods are aligned with IEC 60068-2 and levels are similar to MIL-PRF-28800F Class 3.

Instrument Cooling

The following practices shall be applied to ensure proper and safe operating conditions:

— The primary consideration in using the chassis on a bench is ensuring adequate ventilation for cooling. Ensure that there is at least 50 mm (2 inches) of clearance on the sides, front, and rear of the chassis.

— Ensure adequate clearance is provided around all instrument vents, both air intake vents, and air exhaust vents.

— Ensure that the fan grills are unobstructed.

— To the extent possible, install the instrument in a location with lower ambient temperatures. For example, avoid the situation where the exhaust air from another instrument feeds into the air intake for this instrument.

— The N5185A/N5186A MXG has multiple air intake/exhaust fans. Looking at the instrument display, these fans are located on the left hand side of the instrument, drawing cool air in from the left and pushing hot air out from the right side of the instrument.

Ventilation (when the instrument is rack-mounted)

When installing the instrument(s) into a cabinet, consideration shall be given to the convection flow into and out of the cabinet. Consideration shall also be given to the individual instruments to avoid having the heated discharge of one instrument, now becoming the cooling intake air for another instrument.

Another area of concern is verification that the maximum ambient operating temperature of the instrument(s) is not exceeded by cabinet installation.

Keysight recommends forced air convection whenever an instrument(s) are installed in a cabinet, and further recommends that the maximum operating temperature of the cabinet be reduced 10°C from the lowest, of the maximum operating temperature of a single instrument. If there are any concerns or special requirements a Keysight Field Engineer should be consulted to assure instrument(s) temperature compliance and performance.

Prepare and Power Up the Instrument

Before applying power, read the warnings given in the topic **"Before Applying Power" on page 16**.

1. Make sure that the line cord is plugged into a grounded outlet to establish earth ground.

2. Press the power button to power up the instrument.

    In the following figure, the N5186A MXG is shown. The steps to prepare and power up the instrument are same for N5185A and N5186A.

3. Allow the MXG to warm up for at least 30 minutes before using. Also, see **"Boot-up Time" on page 30**.

Instrument Maintenance

Cleaning the instrument

To remove dirt or dust from the external case of the N5185A/N5186A MXG, clean the case using a dry or slightly-dampened cloth only.

Cleaning Connectors

Cleaning connectors with alcohol shall only be done with the instrument power cord removed, and in a well-ventilated area. Allow all residual alcohol moisture to evaporate, and the fumes to dissipate prior to energizing the instrument.

WARNING To prevent electrical shock, disconnect the instrument from mains before cleaning. Use a dry cloth or one slightly dampened with water to clean the external case parts. Do not attempt to clean internally.

Servicing

WARNING No operator serviceable parts inside. Refer servicing to qualified personnel. To prevent electrical shock do not remove covers.

Where to Get Technical Help

To contact Keysight for sales and technical support, refer to support links on the following Keysight websites.

For product-specific information, support, software, and documentation updates:

http://www.keysight.com/find/n5185a

http://www.keysight.com/find/n5186a

For worldwide contact information, service, and repair:

http://www.keysight.com/find/assist

Returning an Instrument for Service

Calling Keysight Technologies

Keysight Technologies has offices around the world to provide you with complete support for your instrument. To obtain servicing information or to order replacement parts, contact the nearest Keysight Technologies office listed below. In any correspondence or telephone conversations, refer to your instrument by its product number, full serial number, and software revision.

Locations for Keysight Technologies

Online assistance: http://www.keysight.com/find/assist

Americas

Canada	Latin America	United States
1 877 894 4414	(305) 269 7500	1 800 829 4444

Asia Pacific

Australia	China	Hong Kong
1 800 629 485	800 810 0189	800 938 693
India	Japan	Korea
1 800 112 929	0 120 (421) 345	080 769 0800
Malaysia	Singapore	Taiwan
1 800 888 848	1 800 375 8100	0800 047 866
Thailand		
1 800226 008		

Europe & Middle East

Austria	Belgium	Denmark
43 (0) 1 360 277 1571	32 (0) 2 404 93 40	45 70 13 15 15
Finland	France	Germany
358 (0) 10 855 2100	0825 010 700* *0.125 Euros/minute	49 (0) 7031 464 6333
Ireland	Israel	Italy
1890 924 204	972-3-9288-504/544	39 02 92 60 8484
Netherlands	Spain	Sweden
31 (0) 20 547 2111	34 (91) 631 3300	0200-88 22 55
Switzerland	United Kingdom	
0800 80 53 53	44 (0) 118 9276201	

Other European Countries: http://www.keysight.com/find/contactus

Service Options

Keysight Technologies offers several optional maintenance plans to service your instrument after the warranty has expired. Call your Keysight Technologies office for full details.

If you want to service the instrument yourself after the warranty expires, you can download the service documentation that provides all necessary troubleshooting and maintenance information from the Keysight web page.

Packaging the Instrument

Use original packaging or comparable. It is best to pack the unit in the original factory packaging materials if they are available.

CAUTION	Instrument damage can result from using packaging materials other than those specified. Never use styrene pellets in any shape as packaging materials. They do not adequately cushion the equipment or prevent it from shifting in the carton. They cause equipment damage by generating static electricity and by lodging in the instrument louvers, blocking airflow.

You can repackage the instrument with commercially available materials, as follows:
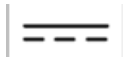
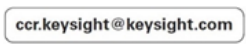| Step	Notes
1. Wrap the instrument in anti-static plastic to reduce the possibility of damage caused by electrostatic discharge	
2. Use a strong shipping container.	The carton must be both large enough and strong enough to accommodate the instrument. A double-walled, corrugated cardboard carton with 159 kg (350 lb) bursting strength is adequate. Allow at least 3 to 4 inches on all sides of the instrument for packing material.
3. Surround the equipment with three to four inches of packing material and prevent the equipment from moving in the carton.	If packing foam is not available, the best alternative is plastic bubble-pack. This material looks like a plastic sheet filled with 1-1/4 inch air bubbles. Use the pink-colored bubble which reduces static electricity. Wrapping the equipment several times in this material should both protect the equipment and prevent it from moving in the carton.
4. Seal the shipping container securely with strong nylon adhesive tape.	
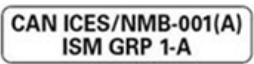
Step	Notes
5. Mark the shipping container "**FRAGILE, HANDLE WITH CARE**" to assure careful handling.	
6. Retain copies of all shipping papers.	

Instrument Markings

The table below lists the definitions of markings that may be on or with the product. Familiarize yourself with each marking and its meaning before operating the signal generator.

Marking	Description
⏻	This symbol marks the standby position of the On/Standby switch. Green backlight = On; Amber backlight = Standby.
|	This symbol marks the ON position of the power line switch.
○	This symbol marks the OFF position of the power line switch.
∿	This symbol indicates that the input power required is AC.
⎓	This symbol indicates DC voltage
3 ∿	This symbol indicates a three-phase alternating current.
⏚	This symbol indicates Frame or chassis Terminal.
⚠	The instruction documentation symbol. The product is marked with this symbol when it is necessary for the user to refer to the instruction in the documentation.
☀	This symbol indicate the presence of a Laser device.
🔥	This symbol indicates the surface can be hot.
⚡	This symbol indicated the product is sensitive to electrostatic discharge.
⏛	This symbol identifies the Protective Conductor terminal.
▣	This symbol indicates the equipment is protected throughout by double or reinforced insulation.

Marking	Description
	The RCM mark is a registered trademark of the Australian Communications and Media Authority.
CE CAN ICES/NMB-001(A) ISM GRP 1-A	This is a space saver label that combines three markings - CE with CAN ICES and ISM (see above) and ISM (see below).
UK CA	The UK conformity mark is a UK government owned mark. Products showing this mark comply with all applicable UK regulations.
ccr.keysight@keysight.com	The Keysight email address is required by EU directives applicable to our product.
CSA ® C US	The CSA mark is a registered trademark of the CSA International.
	Two person lift required.
CAN ICES/NMB-001(A)	Canada EMC label. Interference-Causing Equipment Standard for industrial, scientific and medical (ISM) equipment. Matériel industriel, scientifique et médical (ISM).
[CE] ICES/NMB-001 ISM GRP.1 CLASS A	CE/ICES/ISM Label. (Old mark for reference only). This is a space saver label that combines three markings - CE with CAN ICES (see above) and ISM (see below).
CAN ICES/NMB-001(A) ISM GRP 1-A	This is a space saver label that combines two markings - CAN ICES and ISM.
ISM 1-A	This is a symbol of an Industrial Scientific and Medical Group 1 Class A product (CISPR 11, Clause 5).
KC	South Korean Certification (KC) mark. It includes the marking's identifier code. See also: "Regulatory Compliance" on page 13.
	The crossed-out wheeled bin symbol indicates that separate collection for waste electric and electronic equipment (WEEE) is required, as obligated by the EU DIRECTIVE and other National legislation. Please refer to www.keysight.com/go/takeback to understand your trade-in options with Keysight, in addition to product takeback instructions.

Marking	Description
	China Restricted Substance Product Label. The EPUP (environmental protection use period) number in the center indicates the time period during which no hazardous or toxic substances or elements are expected to leak or deteriorate during normal use and generally reflects the expected useful life of the product.
	Universal recycling symbol. This symbol indicates compliance with the China standard GB 18455-2001 as required by the China RoHS regulations for paper/fiberboard packaging.
IP x y	This mark indicates product has been designed to meet the requirements of "IP x y", where "x" is the solid particle protection and "y" is the liquid ingress protection.

N5185A and N5186A Getting Started Guide

2   Quick Start

Use this guide to unpack and set up the N5185A / N5186A MXG.

The following topic can be found in this section:

KEYSIGHT
TECHNOLOGIES

Boot-up Time

Once AC power is applied to the instrument and the On/Off switch is pressed, the N5185A/N5186A spends a period of time running boot-up tasks (such as hardware initialization). During this time, the **PathWave Signal Generation** screen is displayed:
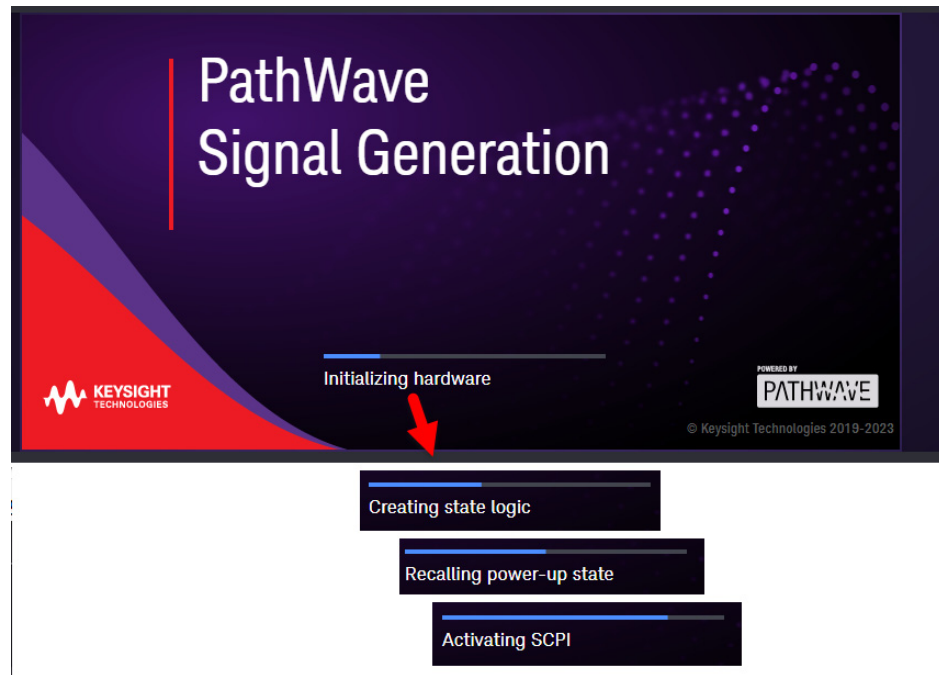
The displayed messages give a rough indication of progress through the boot-up process. The boot-up time is **about 10 minutes** for a four-channel instrument, and proportionally less if there are fewer channels.

The instrument becomes ready for use when the user interface home screen is displayed.

Home screen of N5185A:
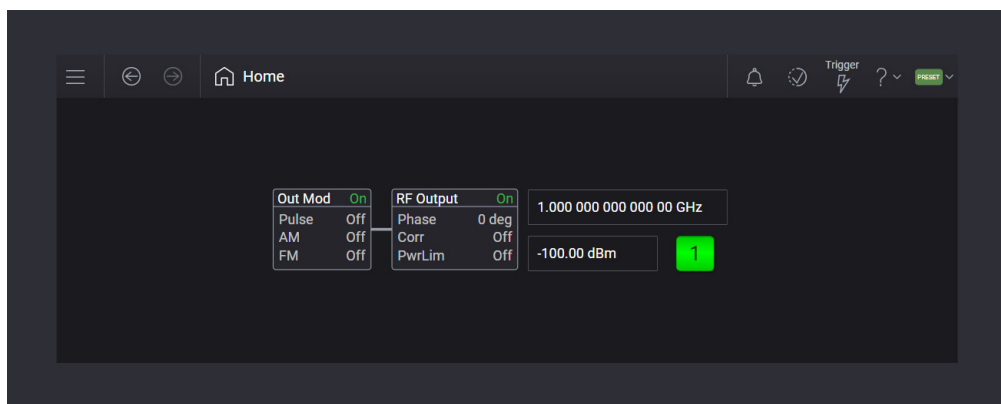
Home screen of N5186A:
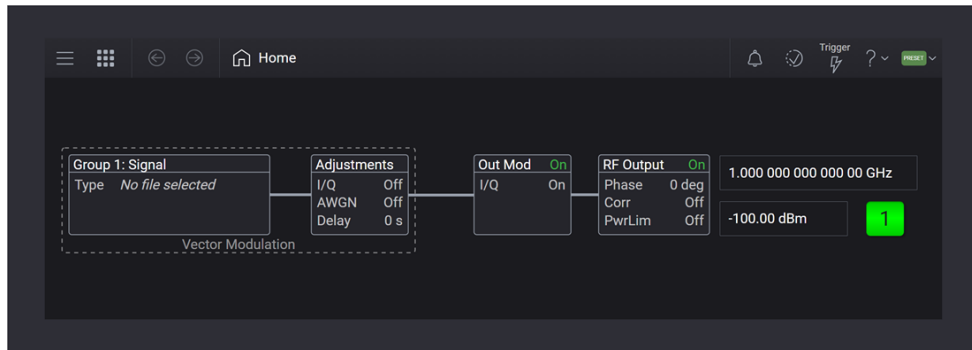
N5185A/N5186A Instrument Hosted Webpages

N5185A and N5186A provide instrument-hosted webpages to allow you to control and configure your instrument remotely using these webpages. You can access these webpages from a browser using either the hostname or IP address of your instrument. These webpages can be accessed by platforms on the same Internet network.

Header Navigation Bar - Launches the following additional webpages.

— Home - The Home page displays detailed configuration information about the N5185A/N5186A MXG Signal Generator. You can use this information to form addresses needed to run SICL or VISA programs, for example.

— Control Instrument - Allows you to control your instrument via SCPI or the instrument's Remote Front Panel that gets launched in your browser.

— Update Firmware - Uploads .ctp files and upgrades the instrument's firmware. The default password is Keysight.

— Configure LAN - Displays network configuration information for the instrument and also allows you to edit this information.

— Upload Files - Transfers data from the browser or another application to the instrument. The default password is Keysight. File are uploaded to the top of the file structure. You can use 'This Computer' and 'All Formats' to find the uploaded files as shown in the sample screen below.
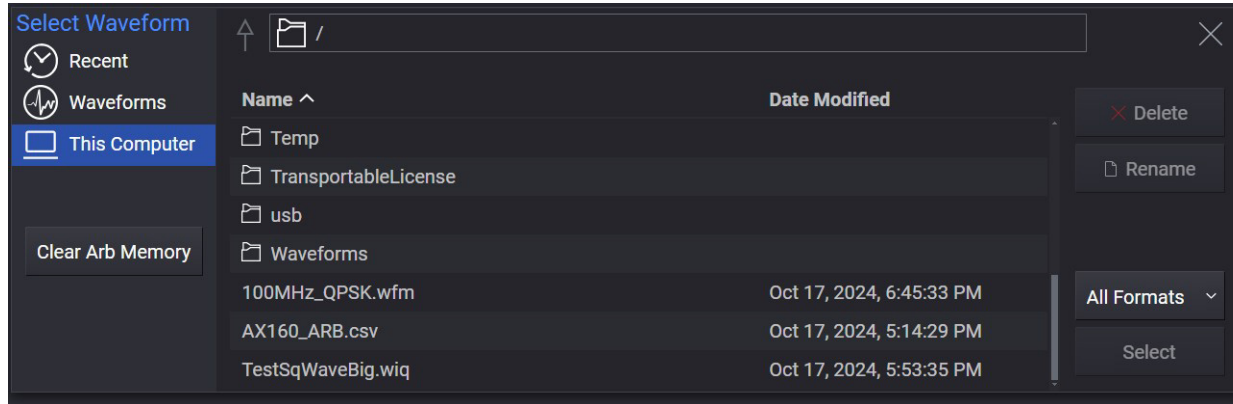
— Export Logs - Downloads runtime logs locally from the instrument.

— Help (? icon) - Displays help text for the page, if available.

— Log in (password entry) - Visible only if passwords are enabled. Permits password entry. The default password is Keysight.

— Password options ("gear" icon) - If passwords are enabled, displays all password options: log in, change password, and disable password. If passwords are disabled, you will see only the Enable password option. You can customize these features for your instrument.

   Footer Navigation Bar - Launches the following additional resources / webpages.

— Support – Navigates to the Keysight product support website.

— Product - Navigates to the Keysight product overview website.

— Download the Help Files - Downloads instrument Help files locally.

— Keysight - Navigates to Keysight.com.

Interface Map

The icons at the top of the display are used (as illustrated below) to access the three basic elements of the user interface: the System menus (for settings and information that apply to the MXG generally), the Apps menu (access to PathWave applications), and the graphical Home screen (for channel-specific settings).
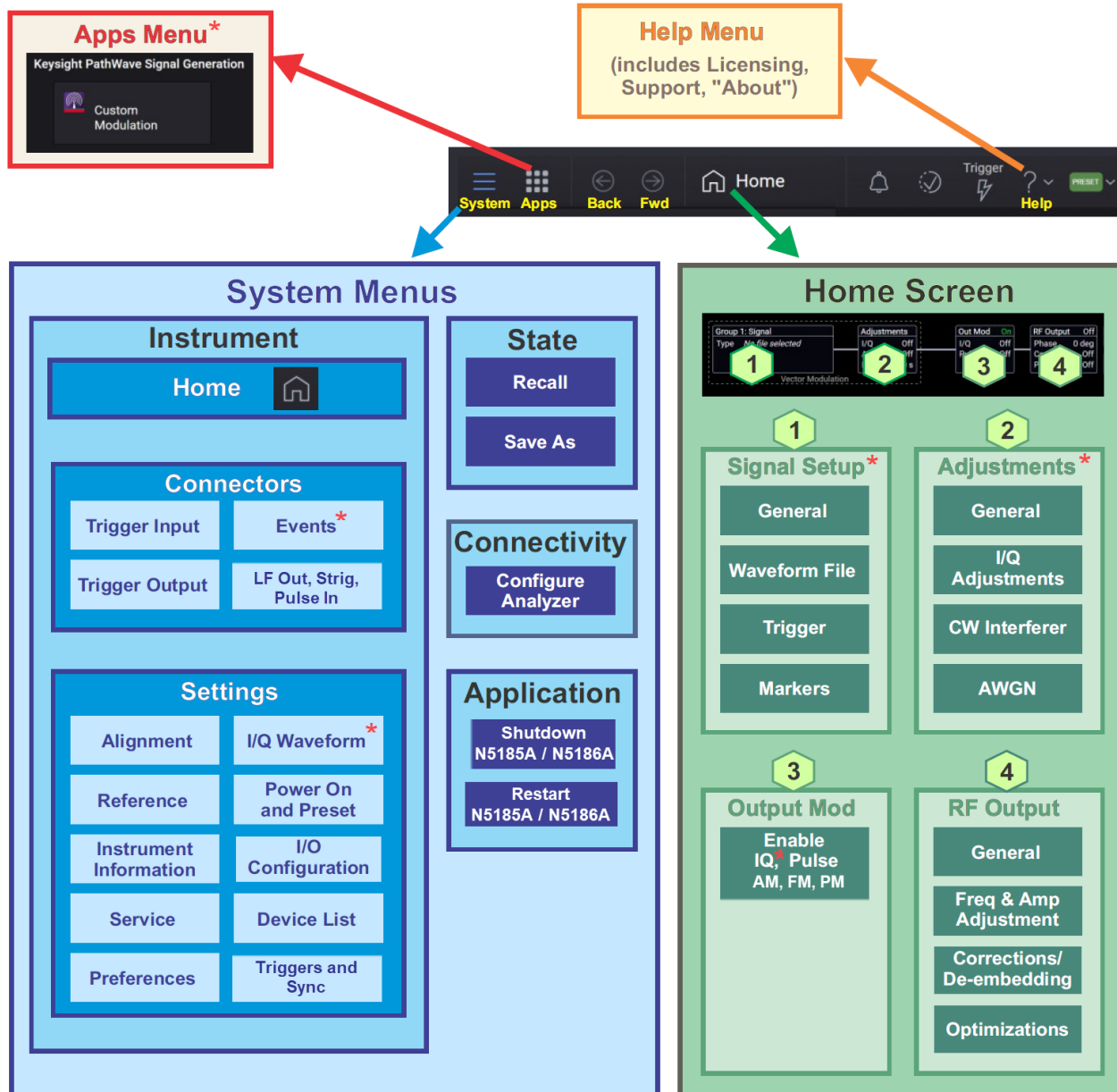
NOTE

The user interface options marked with * in the figure above are applicable only to the N5186A. These are not available in the N5185A user interface.
All other options are available in both N5185A and N5186A.

Verify Operation of the Signal Generator

To verify the operation of the N5185A / N5186A MXG, run a Self Test and Internal Alignments.

The frequency range of the N5185A / N5186A depends on the option ordered:

— Option 503: 9 kHz to 3 GHz

— Option 506: 9 kHz to 6 GHz

— Option 508: 9 kHz to 8.5 GHz

Run a Self Test

Refer to the "Front and Rear Panel Features" on page 41 for a description of the front and rear panel connectors.

1. From the N5185A/N5186A application, select the system (3-bar) icon at the top left corner, and then select **Settings**.
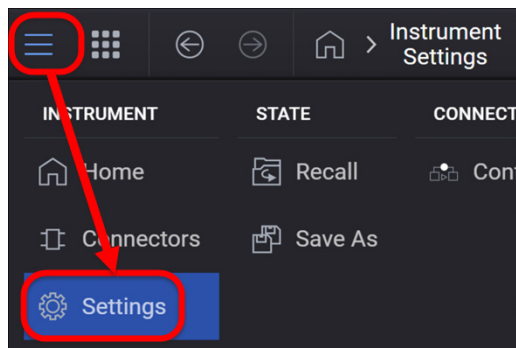
2. Select the **Service** tab.
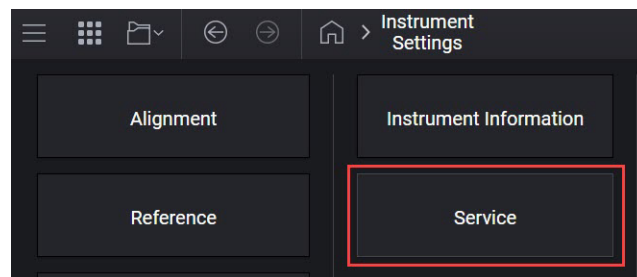
3. Under **Self Test**, press **Run**.
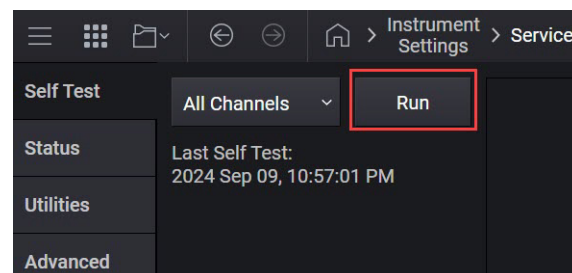
The Self Test takes 5 to 10 minutes to complete, during which a progress indicator and a running report of successes and failures is displayed.

If the Self Test passes, continue on with "Run Alignments" on page 35 and "Generate and View an Output Signal" on page 37.

If there are failures, run Alignments (below), then the Self Test again. If Self Test continues to fail, contact Keysight for help in resolving the issue, at:

https://www.keysight.com/find/assist

Run Alignments

1. From the N5185A/N5186A application, select the system (3-bar) icon (top left corner) and then select **Settings**.

2. Select the **Alignment** tab. Under **Internal Alignment**, click **Perform Alignment**.

The internal alignments calibration will ensure optimal operation of the N5185A/N5186A. An alignment takes approximately 4 minutes per channel for an 8 GHz unit to complete. (An **Internal Alignment done** message is displayed at the bottom of the screen when the process is complete.)

Generate and View an Output Signal

After verifying the operation of the N5185A/N5186A MXG, you are ready to make a measurement.

NOTE   The following measurement uses a N5186A MXG to generate the 2 GHz signal and Keysight Signal Analyzer to analyze it. You may use any frequency depending upon the signal analyzer used. These steps are also applicable to the N5185A MXG.

1. Turn on the Keysight signal analyzer.

2. Connect a cable between the N5185A/N5186A front panel RF Out connector and the RF In connector on the Keysight signal analyzer.

NOTE   For an accurate frequency measurement, connect a 10 MHz Ref cable between the N5185A/N5186A and the signal analyzer.

3. On the N5185A/N5186A MXG, set the following parameters:

    a. **Frequency**: 2 GHz

    b. **Power**: –10 dBm

    c. Select the channel **1** button to turn on channel 1.
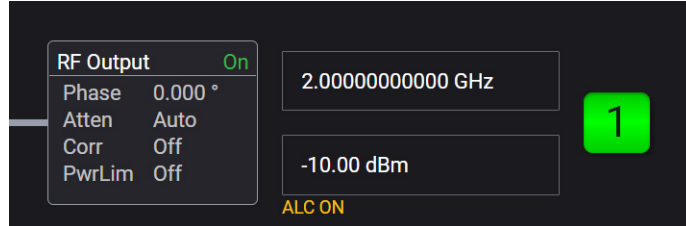
    d. For two and four channel instruments only: In the top right corner of the display, set **RF Out (All)** to **On** by selecting the switch.
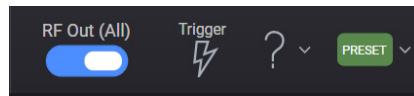
4. On the Keysight signal analyzer, select **Frequency** in the menu panel, then **AUTO TUNE**. Verify that you have a 2 GHz, –10 dBm signal as shown below.

NOTE   For an accurate frequency measurement, connect a 10 MHz Ref cable between the N5185A / N5186A and the signal analyzer.

> **NOTE** Repeat the above steps if you are using N5185A/N5186A MXG with additional channels.

> **NOTE** Open the link and click on Technical Support to access the Measurement guide on making basic and 5G NR measurements.
> https://www.keysight.com/us/en/product/N5186A/N5186A.html

Shutting Down the Instrument

Power down the instrument using the front panel power button. Press briefly to shut down, and allow the software shutdown process to complete. (Do not press and hold the button, as this bypasses the software shutdown process and could cause problems.). Also, do not power down by removing the power cord. For software controlled shutdown, refer to the `SYSTem:PDOWn` SCPI commands.

Related Documentation

The table below provides the list of documentation available for the N5185A/N5186A MXG.

Documentation is updated periodically. For the latest documentation, go to the following URL and select Technical Support:

https://www.keysight.com/us/en/product/N5185A/N5185A.html

https://www.keysight.com/us/en/product/N5186A/N5186A.html

— **Getting Started Guide** (this document; PDF format)

— **Help** (detailed information about features and settings; HTML format)

— **Data Sheet** (features and specifications; PDF format)

— **Configuration Guide** (options, accessories, and standard configurations; PDF format)

— **Measurement Guide** (procedural information; PDF format)

N5185A and N5186A Getting Started Guide

3 Front and Rear Panel Features

This section describes the following features of N5185a / N5186A:

Front Panel Features

N5185A Analog MXG and N5186A Vector MXG can have 1, 2, or 4 RF Out ports, depending on the options ordered. (Although the port connectors are normally located on the front panel, with Option 1EM they are relocated to the rear panel.)

The figure below shows a N5186A MXG.

The following table describes the front panel features for the N5185A / N5186A MXG.

#	Name	Type	Description
1	SS - USB 3.0	USB Type-A female	Host port, SuperSpeed, 900 mA nominal (functions much like a USB port on a PC)
2	USB PD	USB Type-C female	USB 3.0 Type C; "PD" indicates "power delivery"; can supply power and control inputs to external devices
3	On/Off Switch	Pushbutton	Instrument power switch. See "Boot-up Time" on page 30.
4	Display	Touch Screen	Interactive display of the PathWave user interface
5	Keypad	Pushbuttons	These enter numerical values for instrument settings
6	Preset	Pushbutton	Restores the preset configuration of the instrument; see "Preset" on page 43 for details.
7	Trigger	Pushbutton	Executes an immediate trigger; see "Trigger" on page 43 for details
8	Home/Esc/Local	Pushbutton	Aborts the current configuration/control activity; see "Home/Esc/Local" on page 43 for details
9	RF On/Off	Pushbutton	Toggled to enable or disable RF output power; see "RF On/Off" on page 44 for details
10	Arrow Keys	Pushbutton	Each button-push moves the focus of the user interface in the direction indicated.
11	Increment Wheel	Knob + pushbutton	Rotating the knob increments or decrements the currently selected numerical setting; pressing on the knob selects the adjusted value.

#	Name		Type	Description
12	⚠	1-4 RF Out	Type N female	RF Output for Channels 1-4; See **"RF Out 1-4 ports" on page 45** for details

Preset

Press this button to immediately execute an instrument preset (restores configuration settings to their preset values).

Trigger

Press this button to immediately execute an armed trigger (provided that **Signals > Trigger > Trigger Source** has been set to **Key**).

Home/Esc/Local

The **Home/Esc/Local** key aborts whatever configuration or control activity is currently active. For example:

— Return the display to the home screen.

— Close a numeric or alphanumeric configuration window without applying any new settings.

— If the instrument is under remote control, restore local control and dismiss the displayed remote-lockout window.
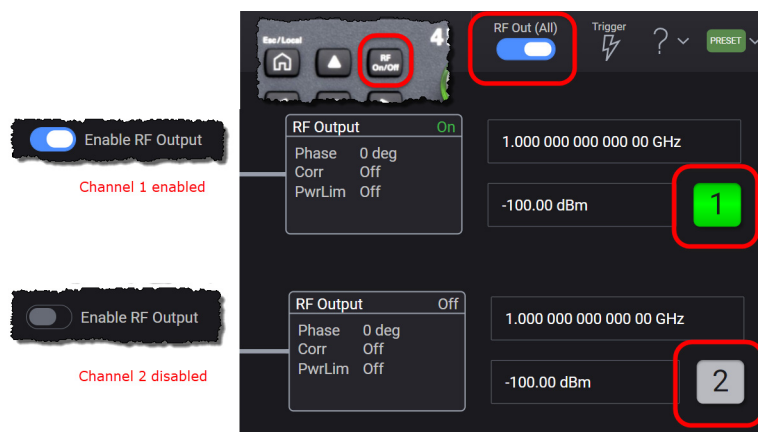
RF On/Off

This front panel key duplicates the effect of **RF Out (All)** on the home screen of the user interface (which is used as a global switch for cutting power from all ports at once). It doesn't matter which of the two you use, but in some situations the front panel key is more convenient.

The **RF On/Off** key operates as a toggle switch; pressing it repeatedly alternates between RF **On** and RF **Off**. The **Off** setting overrides any **Enable RF Output** settings that have been made for individual channels; that is, it cuts RF power to all channels, regardless of their settings. However, the **On** setting doesn't override settings for individual channels; it can only reactivate RF output power for a channel which was enabled to begin with.

In the example setup below, the RF output is enabled for Channel 1, but not for Channel 2.

In this situation, toggling the **RF On/Off** key, or deactivating the **RF Out (All)** control on the home screen, turns off the RF output from Channel 1. The RF output from Channel 2, which is not enabled, is unaffected. The purpose of the displayed triangle symbols is to alert the user that a global output power setting is over-riding ithe power settings for individual channels.
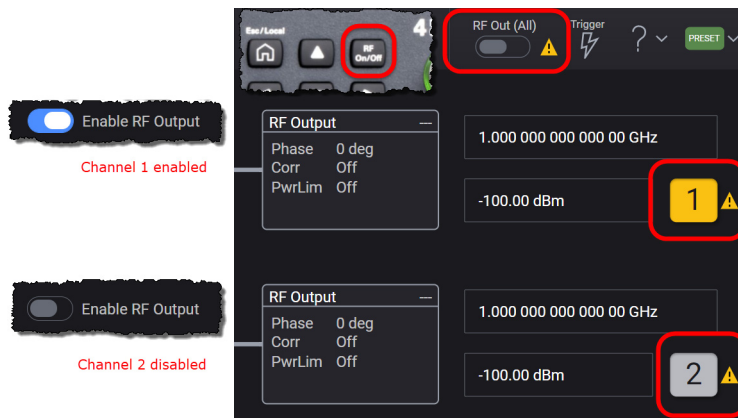
RF Out 1-4 ports

RF Outputs for Channel 1 (Option 001), Channel 2 (Option 002), Channel 3 (Option 003) and Channel 4 (Option 004). (For Option 1EM, see "Rear-panel RF OUT ports" on page 47.)

Type N female connectors; 50 Ω impedance (nominal)
Max port voltage: 50 V DC
Max reverse power: +33 dBm
Frequency ranges: 9 kHz to 3GHz (Option 503); 9 kHz to 6 GHz (Option 505); 9 kHz to 8 GHz

Color halos around **RF Out** ports indicate RF output power status (Green = On, Dark = Off). Yellow indicates that RF output power is Off, but only because the **RF On/Off** toggle switch (or the **RF Out (All)** switch on the home screen) is overriding individual channel settings.

Rear Panel Features
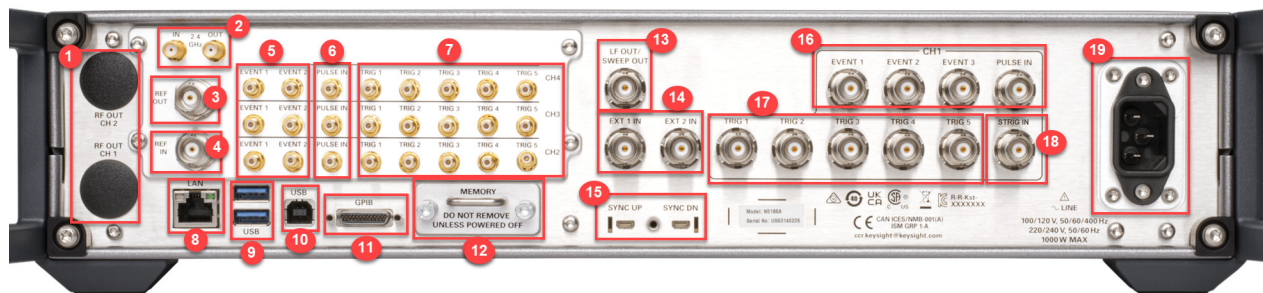
The following table describes the rear panel features of the N5185A / N5186A MXG.

#	Name	Type	Description
1	⚠ RF OUT (Ch 1 - 4)	2 Type N female or 4 SMA female	Rear Panel RF Outputs (Option 1 EM); see "Rear-panel RF OUT ports" on page 47 for details
2	2.4 GHz IN, 2.4 GHz OUT	SMA	(Reserved for future use)
3	REF OUT	BNC	Frequency reference output; see "REF IN/OUT ports" on page 47 for details
4	REF IN	BNC	Frequency reference input; see "REF IN/OUT ports" on page 47 for details
5	EVENT 1 & EVENT 2 (CH2 - 4)	SMB female	Event 1 & Event 2 output ports for Channel 2/3/4 see "EVENT 1/2 ports (CH2-4)" on page 47 for details
6	PULSE IN (CH 2 -4)	SMB female	(Reserved for future use.)
7	TRIG 1 - 5 (CH 2 - 4)	SMB female	Trigger 1-5 input/output ports for Channel 2/3/4; see "TRIG 1-5 ports (CH2-4)" on page 47 for details
8	LAN	RJ-45	Local Area Network connection; see "LAN port" on page 48 for details
9	USB (2 ports)	USB 3.0 Type A female	Host ports, SuperSpeed, 900 mA nominal (these function much like a USB port on a PC)
10	USB (1 port)	USB 2.0 Type B female	Device port; provides remote programming functions via SCPI (USBTMC-USB488)
11	GPIB	Micro-D-25-pin	GPIB connector for SCPI-based remote control; see "GPIB port" on page 48
12	MEMORY	Removable tray	Holder for solid state drive (256 GB NVMe).
13	LF OUT / SWEEP OUT	BNC	Dual-purpose output; see "LF OUT / SWEEP OUT" on page 48 for details.

#	Name	Type	Description
14	EXT 1 IN, EXT 2 IN	BNC	(Reserved for future use)
15	SYNC UP, SYNC DN		(Reserved for future use)
16	CH1 EVENT 1 - 3, PULSE IN	BNC	Event 1-3 ports for Channel 1; see **"CH1 EVENT 1-3" on page 48** for details The PULSE IN port is reserved for future use.
17	CH1 TRIG 1 - 5	BNC	See **"CH1 TRIG 1-5" on page 48** for details.
18	STrig In	BNC	STrig In is used in conjunction with Global Trigger. When Global Trigger Source is set to External, the STrig In connector is used to supply the trigger. Note: Few older N5186A instruments may have this connector labeled as Trig 6.
19	LINE	3-prong plug	AC power receptacle; accepts 3-pronged AC power cord supplied with the instrument.

Rear-panel RF OUT ports

RF OUT ports are located on the rear panel if Option 1EM is ordered. These are as described in **"RF Out 1-4 ports" on page 45**, with these exceptions.

— If there are more than two channels, the connectors are Type SMA female.

— There are no color halos around the ports when they are located here.

REF IN/OUT ports

REF OUT is an internally-generated frequency reference. Under **Instrument Settings > Reference**, you can choose to enable or disable the output, and set the output frequency to 10 MHz or 100 MHz.

REF IN accepts an externally-generated 10 MHz frequency reference. (With Option 1ER, any frequency in the range of 1 to 110 MHz can be used.)

EVENT 1/2 ports (CH2-4)

The output-only **EVENT** ports for channels 2 to 4 furnish programmable timing signals generated by event n (n = 1 or 2).

TRIG 1-5 ports (CH2-4)

The input/output **TRIG** ports for channels 2 to 4 can accept or generate programmable timing signals generated by trigger n (n= 1 to 5).

LAN port

GbE 10/100/1000BASE-T Ethernet: the LAN supports DHCP, connection monitoring, dynamic hostname services, TCP/IP communication, TCP keep alive, and SCPI remote programming.

The LAN connector provides the same SCPI remote programming functionality as the GPIB connector, and is also used to access the internal Web server and FTP server.

GPIB port

This micro-GPIB connector provides remote programming functionality via SCPI (IEEE-488.2, 1987 with listen and talk).

For GPIB cabling, use accessory Y1260A.

LF OUT / SWEEP OUT

LF OUT: a low-frequency (0 to 10 MHz) function generator.

SWEEP OUT: Generates an output voltage ramp (0 to +10 V) when the signal generator is sweeping.

EXT 1 IN / EXT 2 IN

External AM/FM/PM #1/#2 input.

CH1 EVENT 1–3

The output-only **EVENT** ports for channel 1 furnish programmable timing signals generated by event *n* (n = 1 to 3).

CH1 TRIG 1–5

The input/output **TRIG** ports for channel 1 can accept or generate programmable timing signals generated by trigger *n* (n= 1 to 5).

4 Instrument Firmware, Licenses, and System Settings

This chapter describes how to install the firmware and licenses for your N5185A / N5186A. It also includes information about changing some of the system settings.

The following topics can be found in this chapter:

KEYSIGHT
TECHNOLOGIES

Instrument Firmware

The instrument firmware is factory installed in the N5186A / N5186A MXG. For optional software and capabilities, you may purchase the required licenses at a later date.

To determine the currently installed instrument firmware version on the MXG, select **System** > **Settings** > **Instrument Information** > **General**, as shown below.
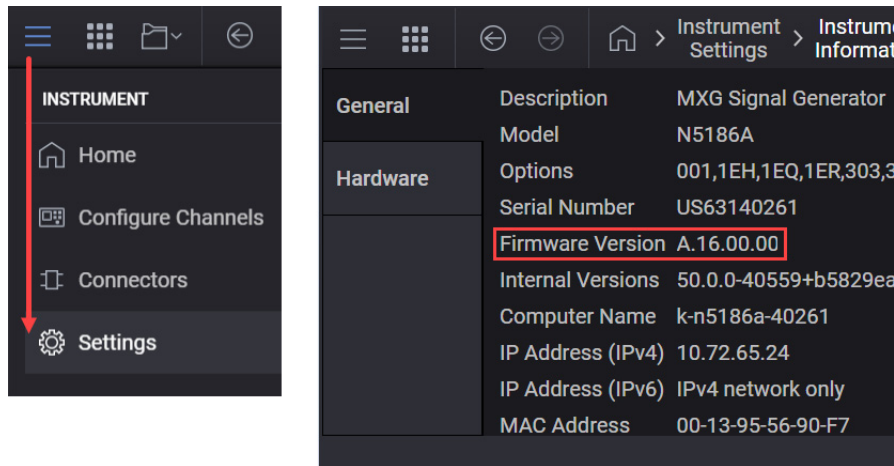
Is Your Product Software Up-To-Date?

Periodically, Keysight releases firmware updates to fix known defects and incorporate product enhancements. To search for firmware updates for your product, visit the following links and select the **Drivers, Firmware, and Software** tab:

https://www.keysight.com/us/en/product/N5185A/N5185A.html

https://www.keysight.com/us/en/product/N5186A/N5186A.html

Upgrading the Instrument Firmware

You can upgrade the firmware by running an installer file (`<filename>.ctp`) on your instrument. This installer file can be downloaded from the links mentioned on the previous page.

Once the installer file is available, you need to upload this file to your instrument. This can be done via a USB thumb drive plugged into one of the instrument's USB ports or via the instrument hosted web UI.
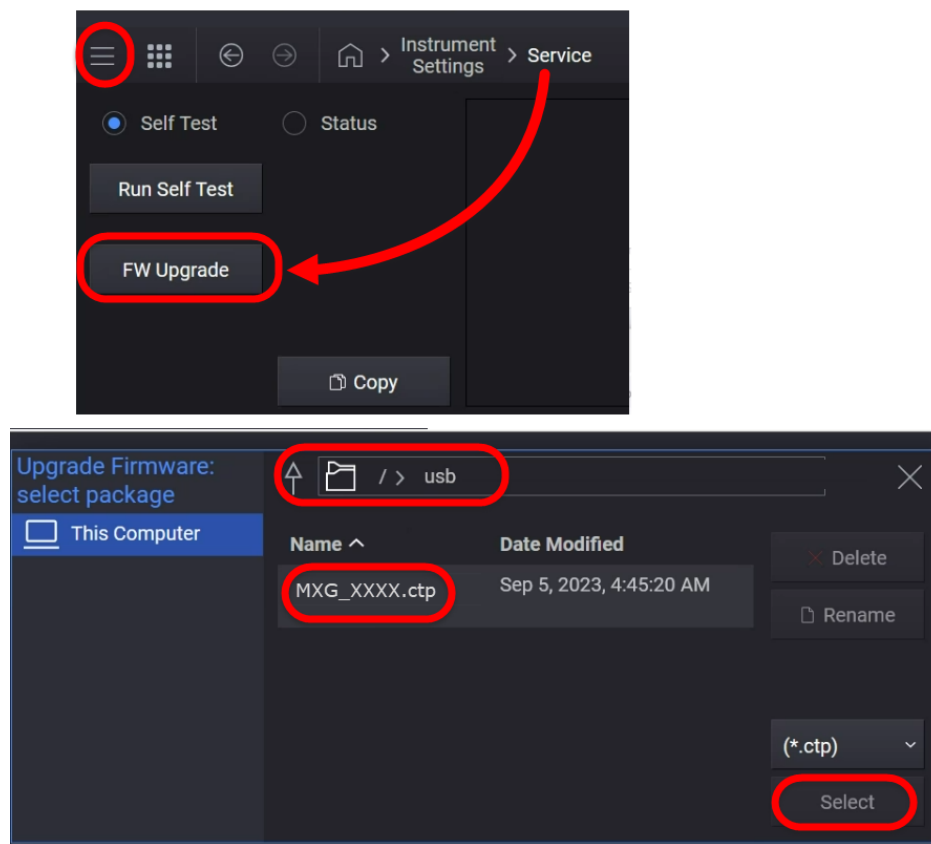
Upgrading Firmware via USB

1. Copy the installer file to a USB drive.

2. Plug the USB drive into one of the available N5185A/N5186A USB ports. There is one USB port on the front panel and two USB ports on the rear panel.

3. On the **System > Instrument Settings > Service** screen, select **FW Upgrade**.

On the screen which opens, navigate to the location on the USB drive where the installer file is saved. Click on the installer file, and click **Select**.

(It is usually not necessary to use the pull-down labeled **(*ctp)**. That is only a filter utility; it limits the display of file names to those of a specific file type.)

Figure 4-1   Upgrading firmware via USB

Upgrading Firmware via Instrument Hosted Web UI

1. Ensure that the N5185A/N5186A is connected to the network.

2. Open an Internet browser on your PC and type the IP address of N5185A/N5186A to access the Home page of the Instrument hosted Web UI.

3. From the Header navigation bar of the webpage, click Update Firmware.

Figure 4-2   Home page of the instrument hosted Web UI


4. The Log In webpage is displayed. Specify Keysight as the password.

5. After logging in, click Choose File, navigate to the location where the installer (.ctp) file is saved on your PC and then upload this file to the instrument.
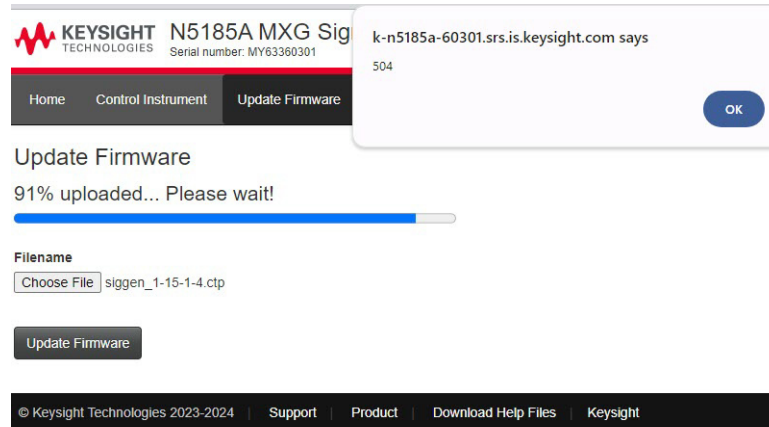
    Note: The upload may seem to have paused just before the completion as shown in the image below. Please be patient and allow it to complete.

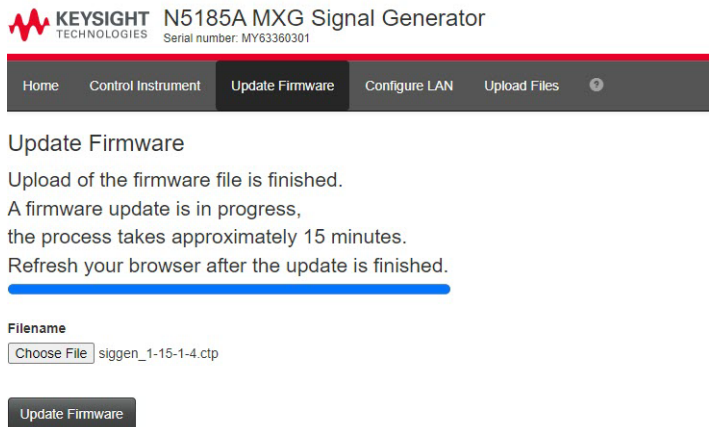**Figure 4-3**   Update Firmware webpage
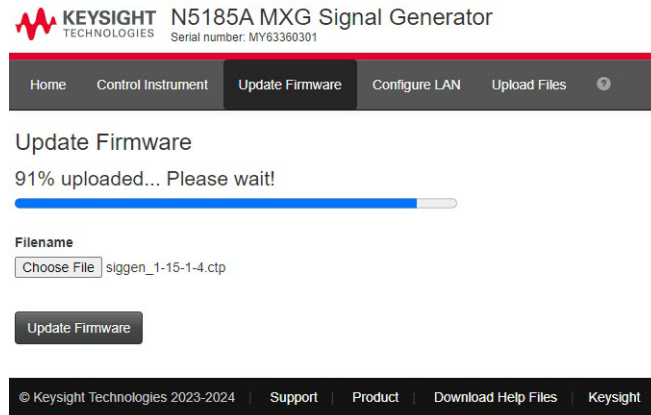
6. Click OK to acknowledge the displayed message.

**Figure 4-4**   Update Firmware webpage

7. The Upload Complete message is displayed on the webpage when the installer file is uploaded successfully to the instrument. Then the firmware upgrade starts on the instrument.

Figure 4-5   Upload Complete message

8. While upgrading firmware, the instrument reboots and enters the Recovery mode as shown in the following screen. Wait for the firmware upgrade to complete and for the instrument to reboot with the upgraded firmware.

Figure 4-6   Instrument in Recovery mode
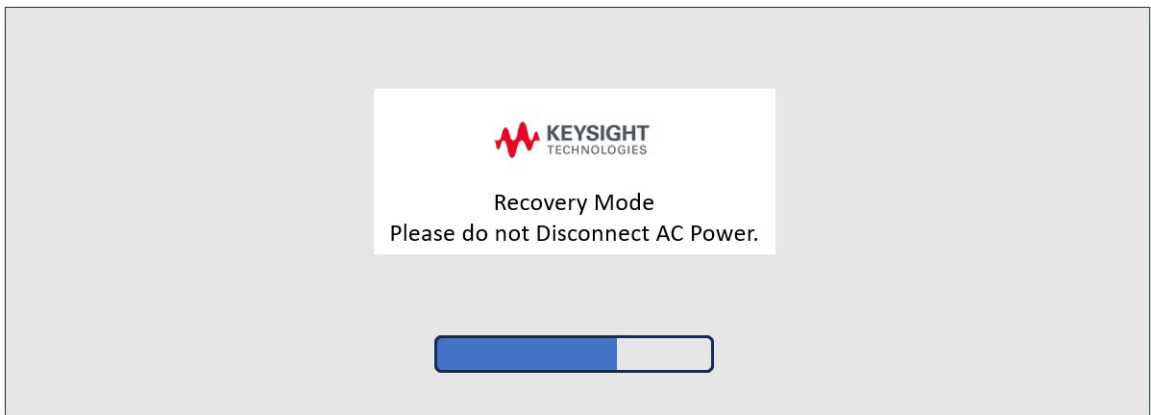
> **NOTE** The first bootup after a firmware upgrade can take significantly longer than a normal bootup because of possible FPGA proceeding in the background. 4 channel instruments can take significantly longer because 4x as many FPGAs need to be updated. After the first bootup, the instrument should boot up normally thereafter and no longer need to update any FPGA firmware.

Licensing Options

Three license types are available for N5185A/N5186A:

1. Hardware option licenses (fixed, perpetual licenses only). For example, Option 503 is for a frequency range of 9 kHz to 3 GHz.

2. PathWave software option licenses, **N76xxAPPC** and **E76xxAPPC** (fixed, network, and USB-portable types). Can be perpetual or a time-limited subscription.

3. Signal Studio software licenses, **N76xxEMBC**. Can be perpetual or a time-limited subscription.

Software licenses are identified by means of a model number combined with a three-character suffix known as an option designator. The illustration below shows the elements of complete license numbers and their meanings.

Figure 4-7   Elements of a software license number
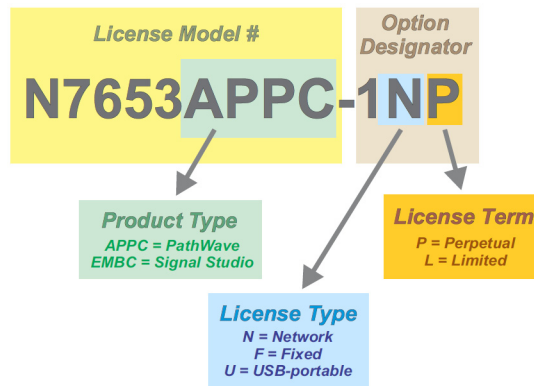
Fixed Licenses

A fixed license (sometimes called a "node locked" license) cannot be shared between instruments; it is assigned to one instrument specifically. For Signal Studio licenses, only Fixed Licenses are available. (For PathWave licenses, network licenses and USB portable licenses are available as well.)

Fixed licenses are obtained (as downloadable files) from Keysight, and must be installed on the N5185A/N5186A. The license is configured to run only on one specific instrument, identified by its Host ID.

To install a fixed license, you need to upload and add the license file to the instrument. This can be done via USB or the instrument hosted webpages.

### Installing a Fixed License via USB

1. Copy the license file to a USB memory stick.

2. Plug the memory stick into one of the available N5185A/N5186A USB ports. There is one USB port on the front panel and two USB ports on the rear panel.

3. Click on License Manager from the Help ("?") icon at the top right of the instrument display and select Browse to find the license file.

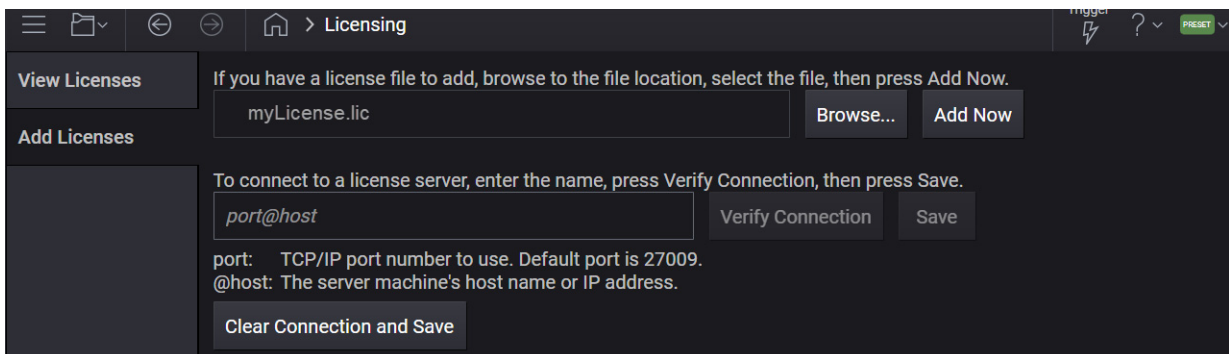**Figure 4-8**   Accessing the License Manager
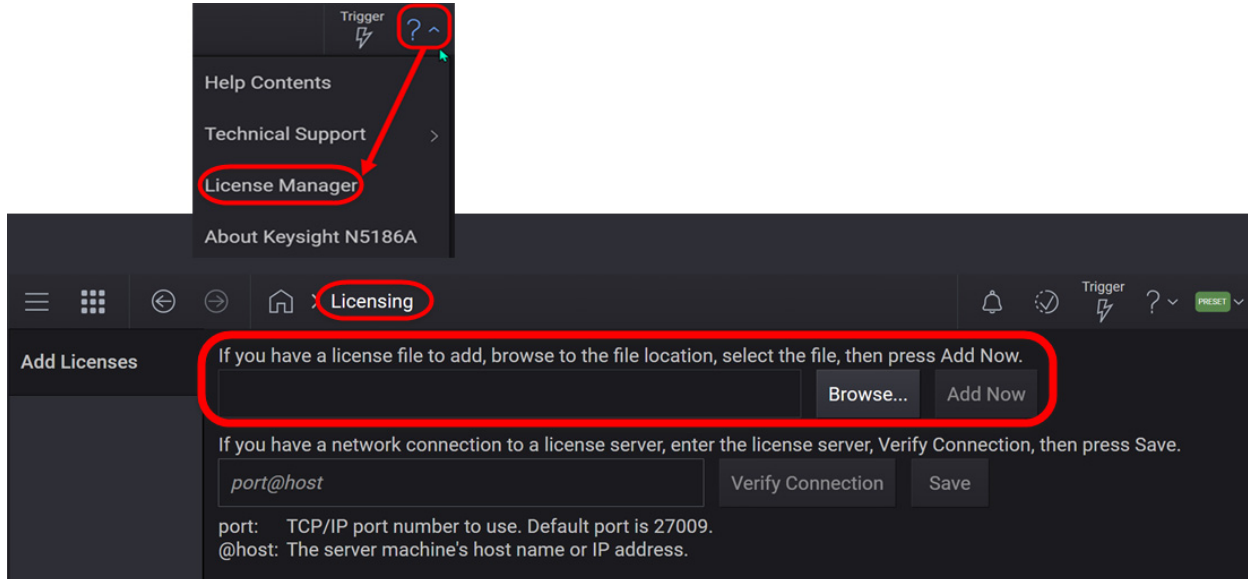
4. Navigate to the usb folder, select the license file, and then click Select.
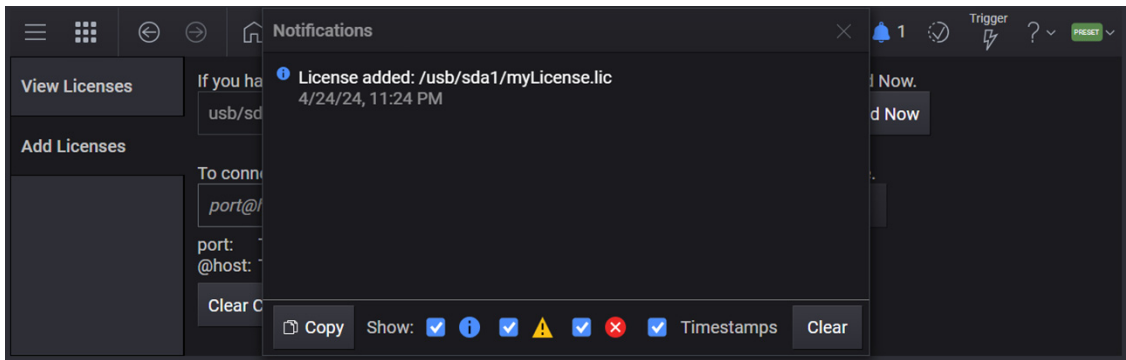
Figure 4-9   Selecting the license file
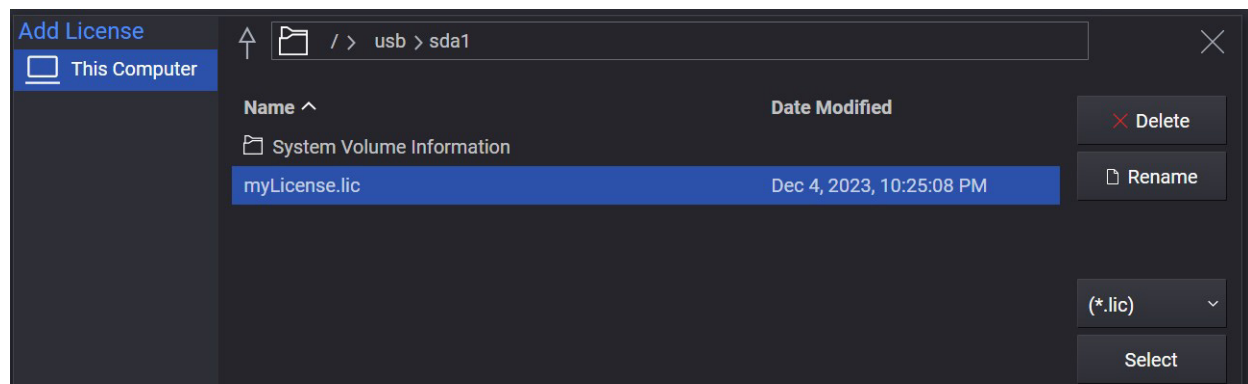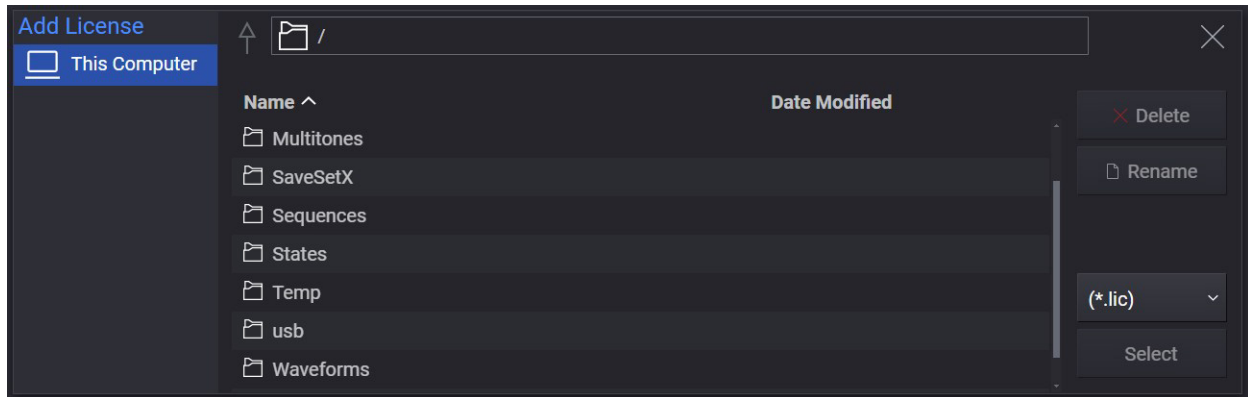
5. Click Add Now.

Figure 4-10   Adding the license file

6. The following notification is displayed that the license has been added to the instrument.

**Figure 4-11**   License install notification

7. Reboot the MXG using the soft reboot or power button.

Installing a Fixed License via the Instrument's Web UI

1. Ensure that the N5185A/N5186A is connected to the network.

2. Open an Internet browser on your PC and type the IP address of
    N5185A/N5186A to access the Home page of the Instrument hosted Web
    UI.

3. From the Header navigation bar of the webpage, click Upload Files.

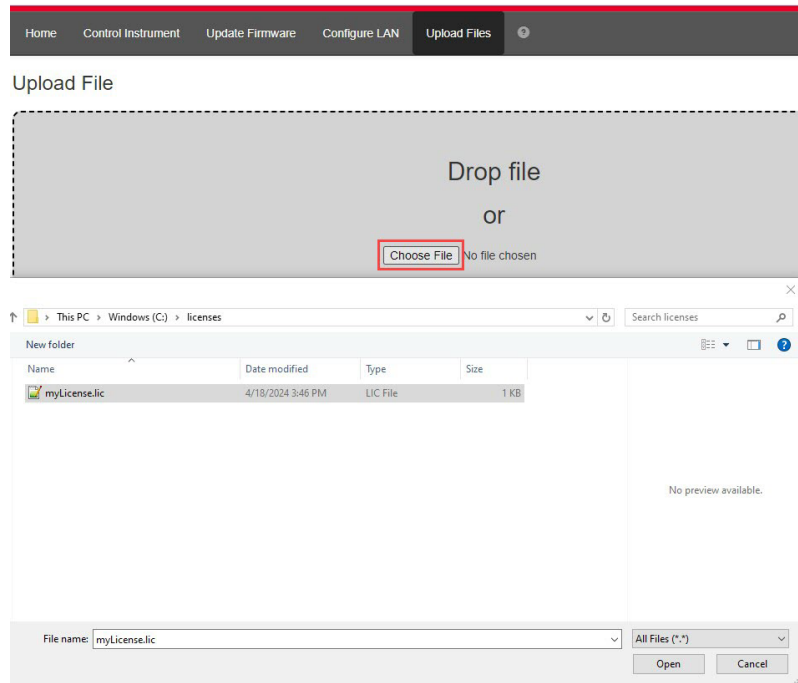**Figure 4-12**   Home page of the instrument hosted Web UI
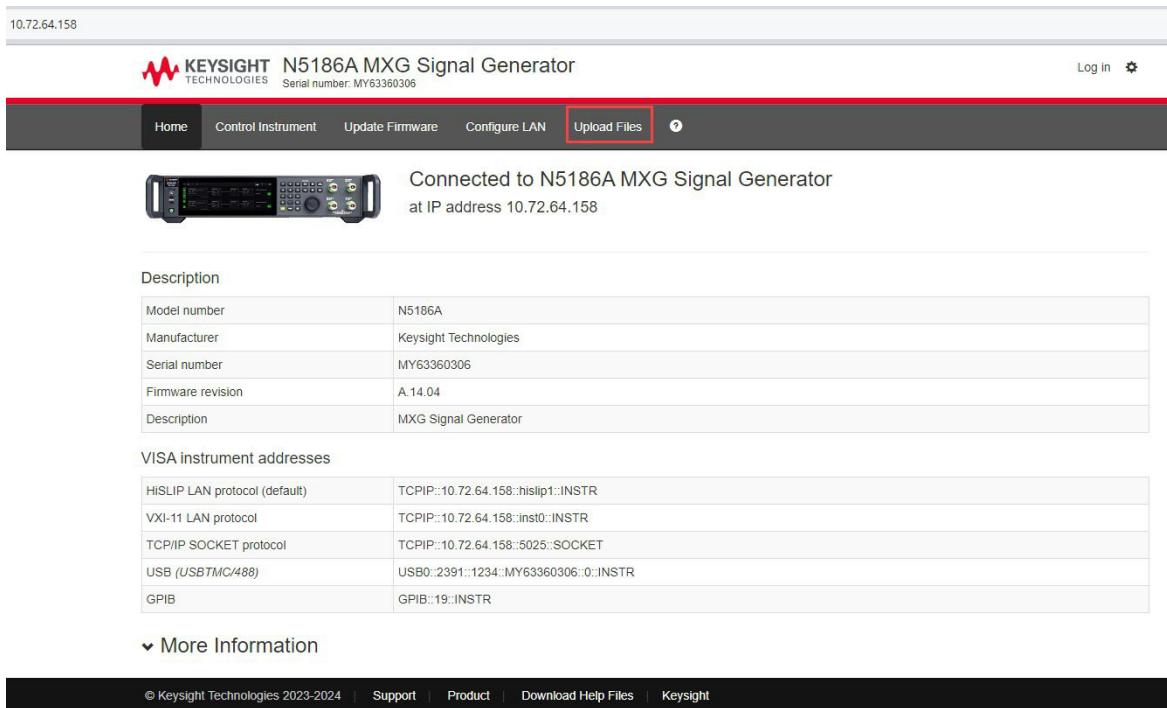
4. The Log In webpage is displayed. Specify Keysight as the password.

Figure 4-13   Log In webpage
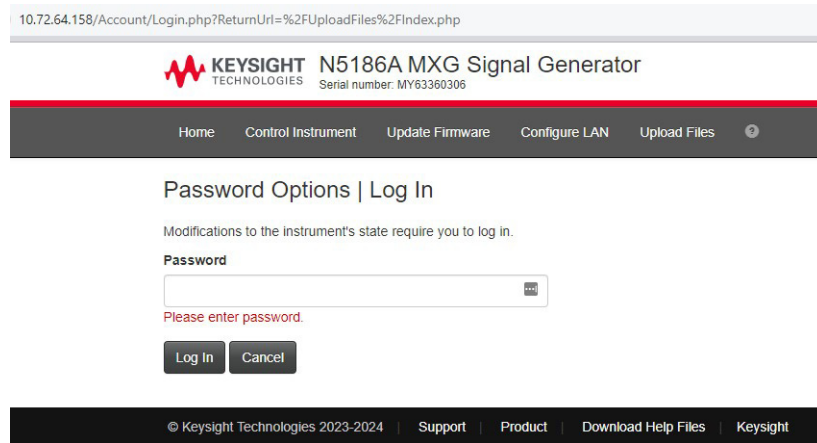
**5.** After logging in, click Choose File in the Upload Files webpage. Then navigate to the location where the license file is saved on your PC and click Open.

Figure 4-14   Upload Files webpage

6. The Upload Complete message is displayed on the webpage when the license file is uploaded successfully to the instrument. The location for the uploaded file is the root directory of the instrument.

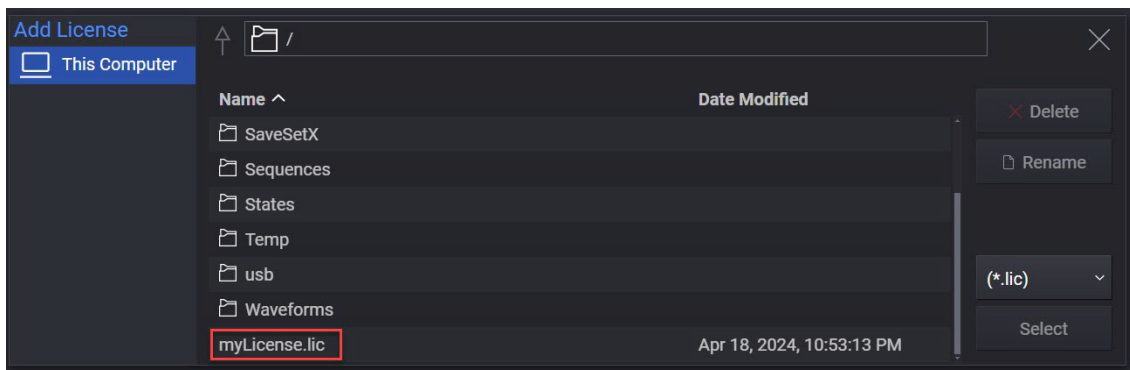**Figure 4-15**   Upload Complete message
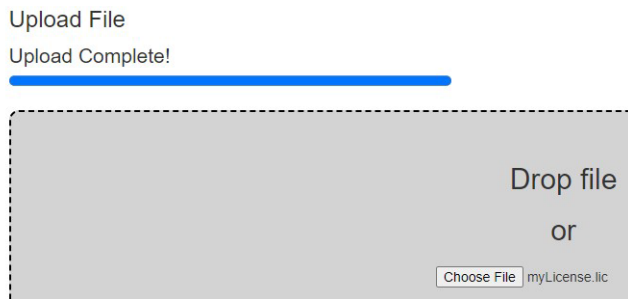
7. Click on License Manager from the Help ("?") icon at the top right of the instrument display. Then select Browse to navigate to the root directory of your instrument where the license file is uploaded.

Figure 4-16   Accessing the License Manager
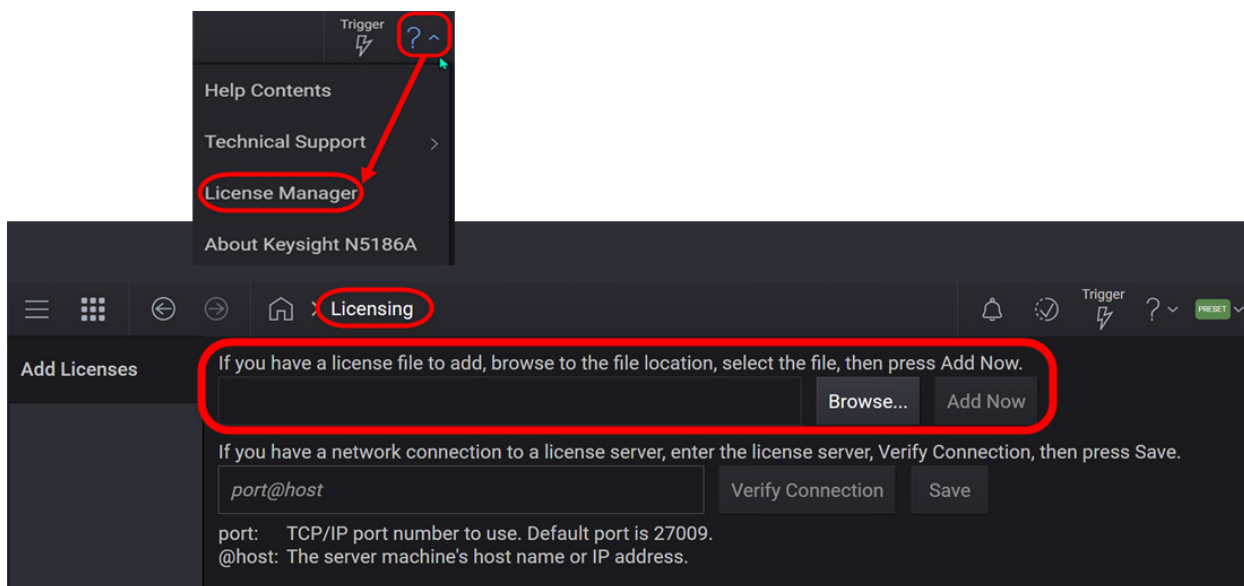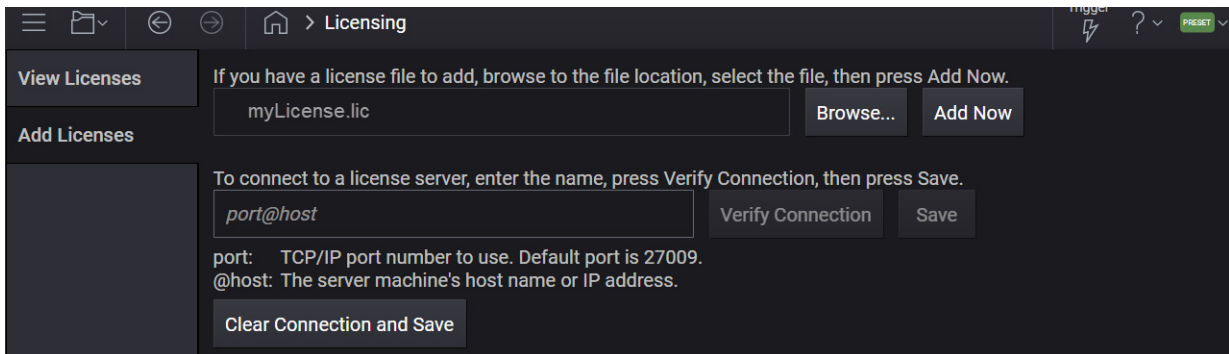

8. Select the license file and then click Select.

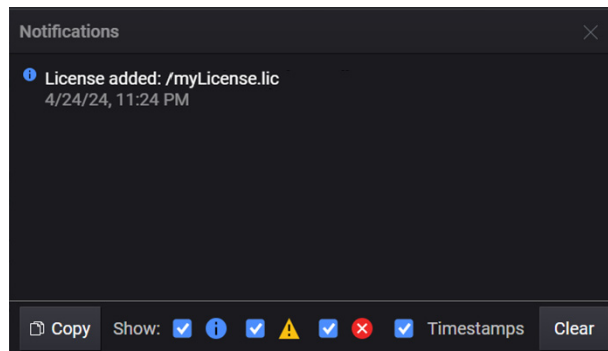**Figure 4-17**   Selecting the license file

9. Click Add Now.

Figure 4-18   Adding the license file

The following notification is displayed that the license has been added to the instrument.

Figure 4-19   License install notification

10. Reboot the MXG using the soft reboot or power button.

USB-portable Licenses

A USB-portable license can be shared between instruments, but it can only be used on one instrument at a time. The process of installing the license is the same as the process described under "Fixed Licenses" on page 56. However, in the case of a USB-portable license, a second step is necessary to make use of the license.

The license must be enabled by plugging a physical dongle (purchased from Keysight) into one of the USB ports of the N5185A/N5186A. The dongle assigns a specific Host ID to the N5185A/N5186A. As this Host ID is referenced in the installed license, the software is enabled to run (so long as the dongle remains attached to the N5185A/N5186A).

If the license is also installed on another instrument, that instrument's license can be enabled by plugging in the dongle there. (However, the application must be restarted when the dongle is plugged into that instrument.)

Network Licenses

A network license (also known as a floating license) is similar to a USB-portable license, in the sense that it can be used by more than one instrument, but only by one instrument at a time. However, in this case, license usage is controlled by a license server on the local network, and not by a physical dongle. The instrument accesses and saves a license from the server.

The network license is installed by clicking on **License Manager** from the Help ("**?**") icon at the top right of the display. Enter the **port@host** address of the license server, click **Verify Connection**, then press **Save**.

Figure 4-20   Saving a network license
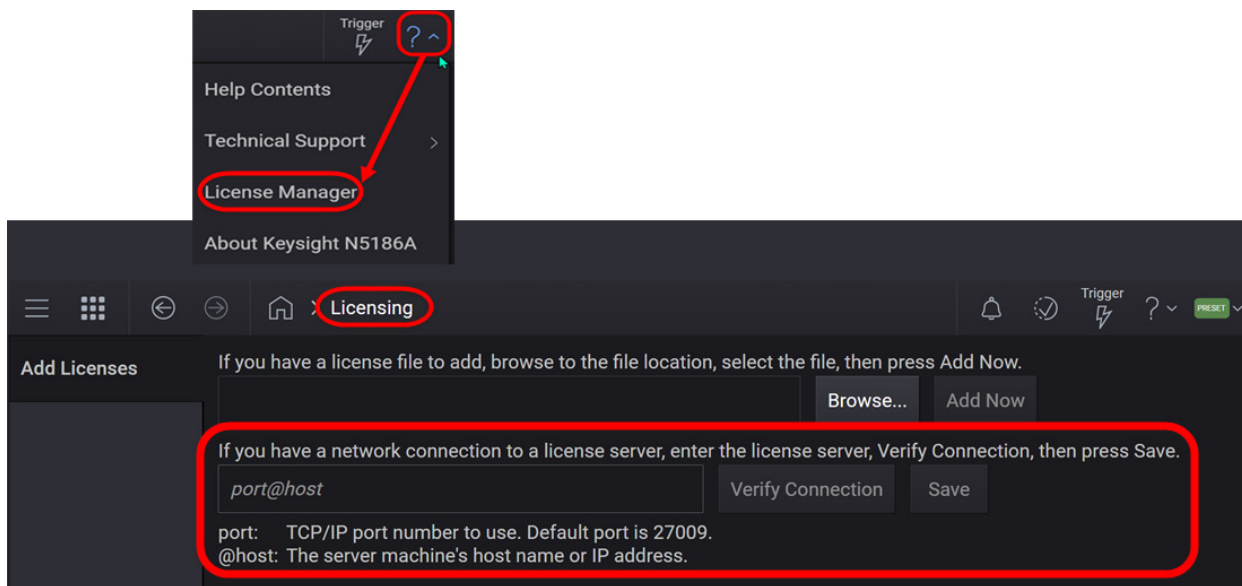
Configuring LAN

Hostname

The Computer Name, or Hostname, is preconfigured from the factory. It must be a unique name such that it does not conflict with other equipment on your LAN. The preconfigured Computer Name is K–<model number>–xxxxx, where xxxxx is the last 5 digits of the instrument's serial number.

IP Address & Gateway

The instrument is preconfigured to obtain an IP Address via DHCP. However, you can also change the **IP Address**, **Subnet mask**, and **Gateway** manually. On the system menu, go to **Instrument Settings > I/O Configration > Networking**. Under **LAN Configuration**, select **Manual** to make the addresses editable, as illustrated below.

Figure 4-21   LAN Configuration
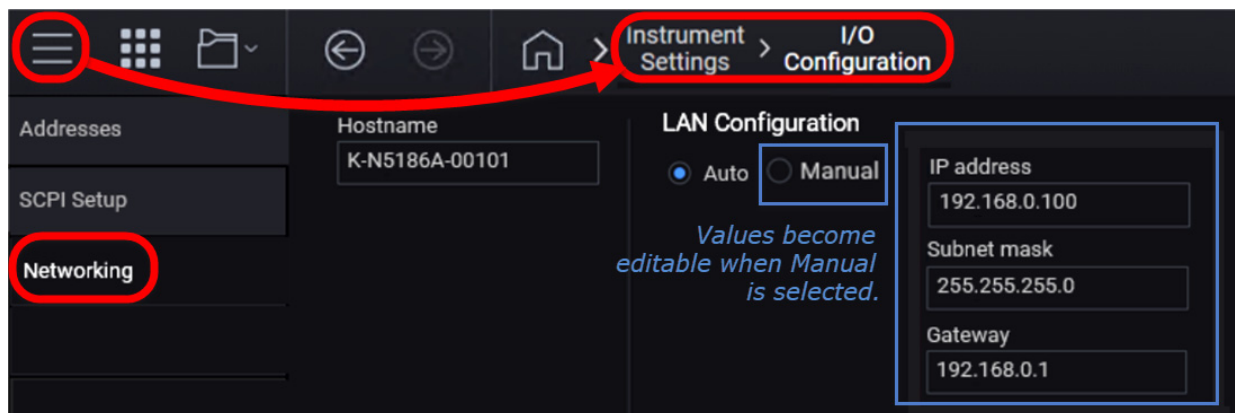
System Maintenance

Backup

It is recommended that you have a regular backup strategy. Your IT department may already have a backup strategy in place that is suitable for the instrument and its data.

When performing backups, we recommend that you backup the data to an external storage device connected to the network or one of the instrument's USB connectors. Also, you should perform backups at times when the instrument is not being used for normal operations, as it may impact the instrument's overall performance.

USB Connections

USB Type A ports (labeled as #1 in the illustration below) are compatible with the USB 2.0/3.0 and 1.1 specification. A Type A port serves as the USB Host port for the instrument; supporting human interface and mass storage [also true of type c ports.

USB Type C ports (labeled #2 in the illustration below) are functionally the same as the Type A ports described above; however, Type C also supports USB Power Delivery.

The USB Type B port (labeled as #3 in the illustration below) is a USB Test and Measurement Class device port. Specifically, the device class is the USBTMC-USB488 subclass. This can be used to control the N5185A/N5186A from a separate PC.

Figure 4-22   N5185A/N5186A USB Ports (front & rear panels)

5 Removable Memory

The following topics can be found in this section:

KEYSIGHT
TECHNOLOGIES

Overview

Keysight provides a removable Solid State Drive (SSD) for your N5185A/ N5186A MXG.

The SSD is mounted in a receptacle on the rear panel of the N5185A/N5186A chassis and can be easily inserted or removed. This is convenient when multiple people are using the same N5185A/N5186A and they do not want to interfere with the other person's project, or when the instrument is used in a controlled secure environment.

SSD Removal and Installation

CAUTION	Electrostatic discharge (ESD) can damage or destroy electronic components. All work on electronic assemblies should be performed at a static-safe workstation. Refer to the documentation that pertains to your instrument for information about static-safe workstations and ordering static-safe accessories.

1. Turn the instrument off and remove the AC power cord.

2. Remove the screws as shown in the figure below. Use a T10 Torx driver if necessary.

3. Pull on the handle to unseat the SSD and remove the SSD.

4. Install the new SSD by aligning the SSD PC board edges with the card guides. Insert the SSD completely.

5. Tighten the screws to no more than 9 in-lbs.

Firmware Updates

Refer to **"Upgrading the Instrument Firmware" on page 51** to know how to upgrade the instrument's firmware.

Instrument Security Information

Information on the instrument security features and the instrument volatility can be found at:

http://www.keysight.com/find/security

KEYSIGHT